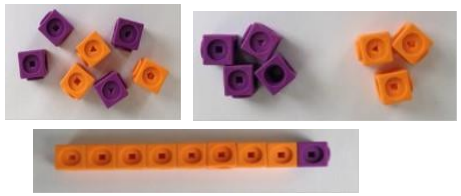
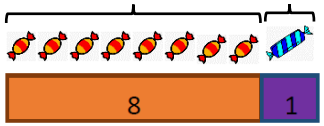
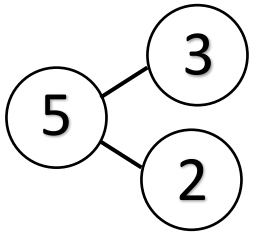
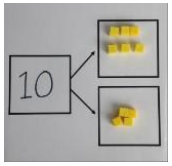
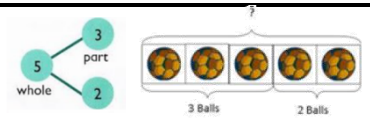
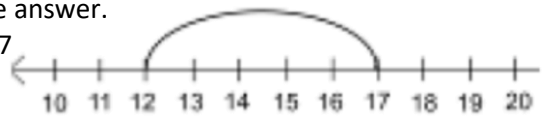
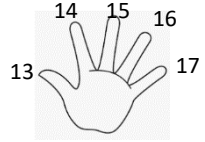
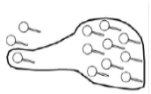
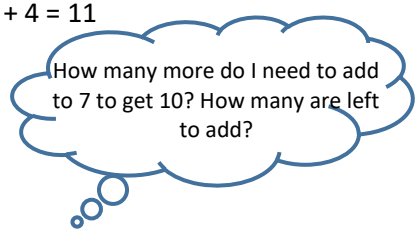
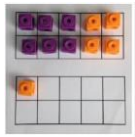
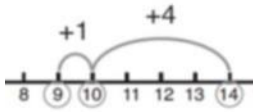
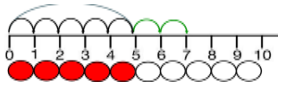
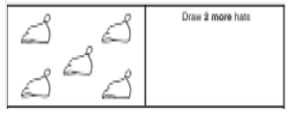
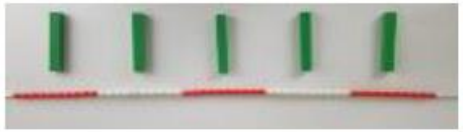
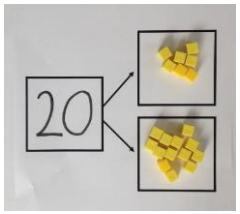
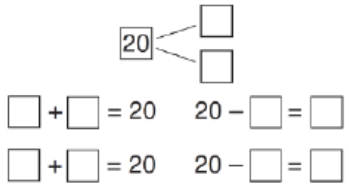
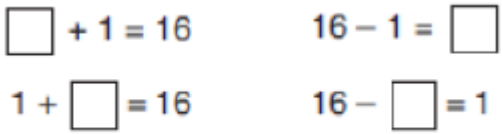
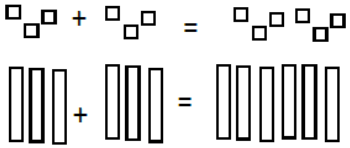
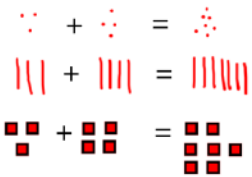
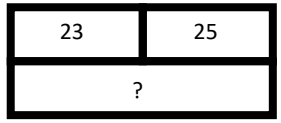
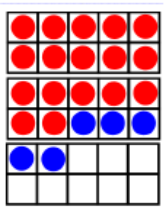
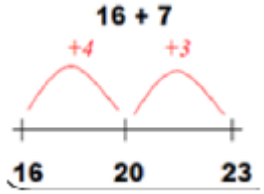
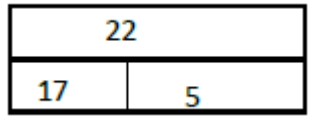
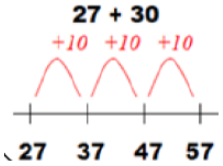
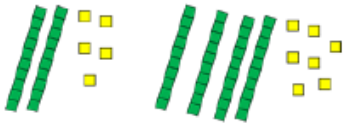
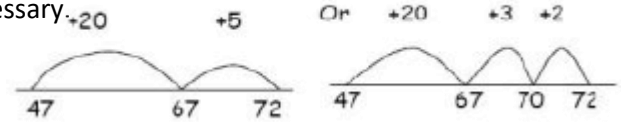
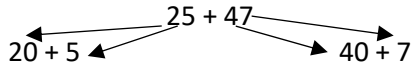
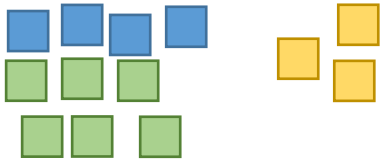
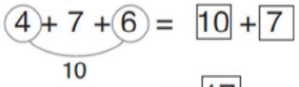
St Bridget's C of E Primary School Calculation Policy

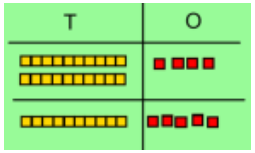
November 2019

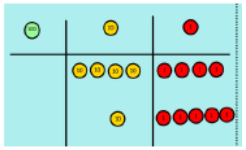
	Strategy	Concrete	Pictorial	Abstract
Year 1 Addition	Combining two parts to make a whole: part-whole model	Use cubes to add two numbers as a group or a bar. 	Use pictures to add two numbers together as a group or in a bar. 	Use the part-whole model to move onto abstract.  2 + 3 = 5
		Use part-whole models. 	Use part-whole models to support. 	
	Starting at the larger number and accounting on	Start with the larger number on the bead string and then count on the smaller number 1 by 1 to find the answer. 12 + 5 = 17 	Start with the larger number on the number line and then count on the smaller number 1 by 1 or in one jump to find the answer. 12 + 5 = 17 	Place the larger number in your head and count on the smaller number, using fingers if necessary. 12 + 5 = 17 
	Regrouping to make 10	9 + 3 = 10 + 2 = 12 	Regroup or partition using a diagram. 3 + 9 = 	7 + 4 = 11 
		Use ten frames. Start with the larger number and use the smaller number to make 10. 	Regroup or partition using a number line. 9 + 5 = 14 	
	Represent and use number bonds and related subtraction facts within 20	2 more than 5 	Use number lines 	Emphasis should be on the language *'1 more than 5 is equal to 6.'* *'2 more than 5 is 7.'* *'8 is 3 more than 5.'*
			Use pictures 5 + 2 	

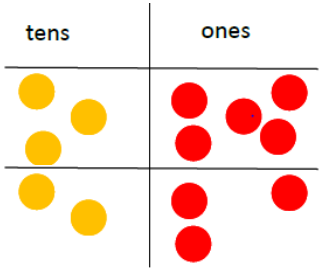
Year 2 Addition	Strategy	Concrete	Pictorial	Abstract
	Adding multiples of 10	20 + 30 = 50 Model using base 10 and bead strings 	3 tens + 5 tens = 8 tens 30 + 50 = 80 	20 + 30 = 50 70 = 50 + 20 40 + __ = 60
	Use known number facts Part-whole model	Children explore different ways of making numbers within 20 using cubes within part-whole models. 13 + 7 = 20 	Children explore different ways of making numbers within 20 using numbers within part-whole models. 	Children explore different ways of making numbers within 20 using mental strategies. 
	Use known facts Base 10	Children to explore related facts. 3 + 3 = 6 30 + 30 = 60 	Children to explore related facts by drawing base 10. 3 + 4 = 7 30 + 40 =70 300 + 400 = 700 	Use known facts: 3 + 4 = 7 So 30 + 40 = 70 So 300 + 400 = 700
	Bar model	3 + 4 = 7 – use real-life objects arranged in bar 	7 + 3 = 10 Use drawings arranged in a bar. 	23 + 25 = 48 

Year 2 Addition	Strategy	Concrete	Pictorial	Abstract
	Add a two-digit number and ones	Use ten frame to make 'magic ten' Children to explore patterns 17 + 5 = 22 27 + 5 = 32 	Use number line 	Explore fact families 17 + 5 = 22 5 + 17 = 22 22 – 17 = 5 22 – 5 = 17 
	Add a two-digit number and tens	Base 10 25 + 10 = 35 	Use number line 	Mental strategies 27 + 10 = 37 27 + 20 = 47 27 + __ = 57
	Add two two-digit numbers	Base 10 25 + 46 = 71 (Recap exchanging) 	Use number line; bridge ten using part whole if necessary. 	Partitioning  20 + 40 = 60 5 + 7 = 12 60 + 12 = 72
	Add three one-digit numbers	Cubes Use number bonds if possible to make 10 first. 4 + 3 + 6 = (4 + 6) + 3 = 13 	Regroup and draw representation.  3 + 5 + 7 10 + 5 = 15 	Combine the two numbers that make/bridge 10, then add the third. 

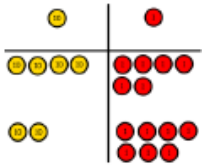
<table>
<tr><td rowspan="3">Year 3 Addition</td><td>Strategy</td><td>Concrete</td><td>Pictorial</td><td>Abstract</td></tr>
<tr><td>Column addition – no regrouping

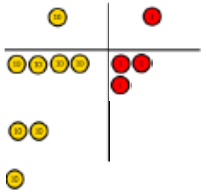
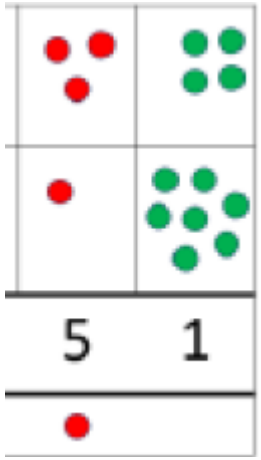
Add two or three 2 or 3-digit numbers</td><td>Use base 10 in columns
24 + 15 = 39
 

Move onto using place value counters
44 + 15 = 59
  </td><td>Children to move onto drawing the counters using a tens and one frame.

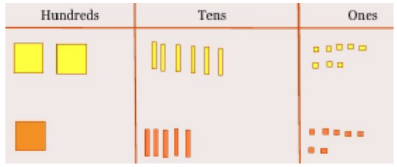
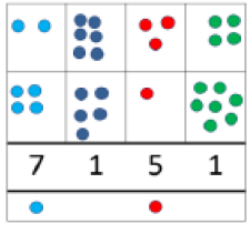
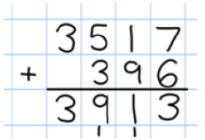
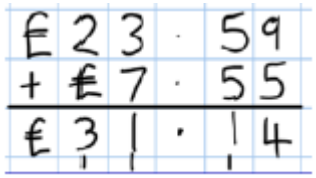
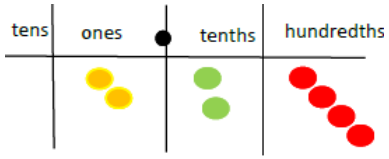
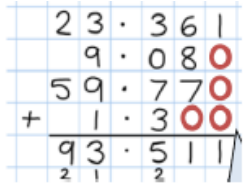
35 + 23 = 58
 
</td><td>Add the ones, then the tens, then the hundreds.

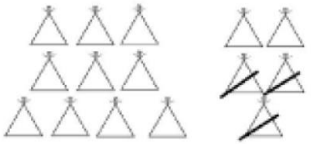
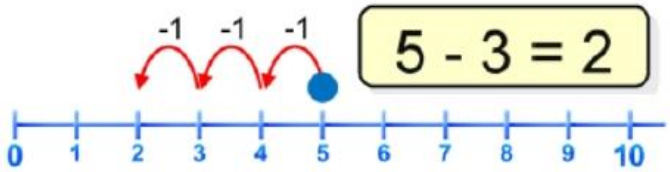
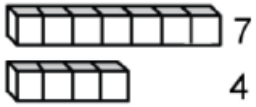
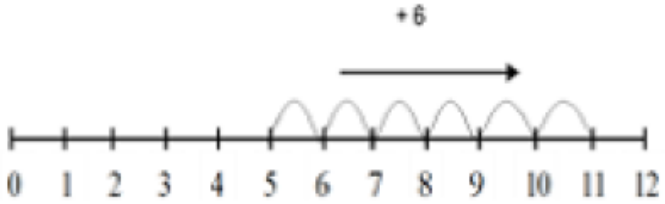
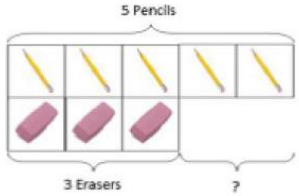
2 2 3
+ 1 1 4
3 3 7</td></tr>
<tr><td>Column addition with regrouping</td><td>Use place value counters in a column.
Exchange ten ones for a ten.

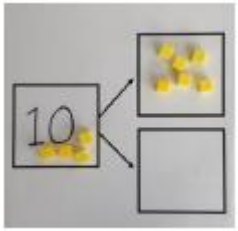
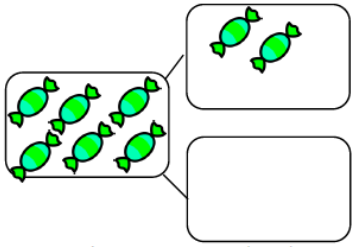
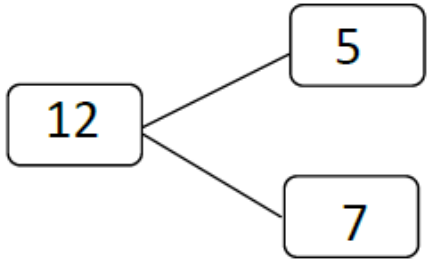
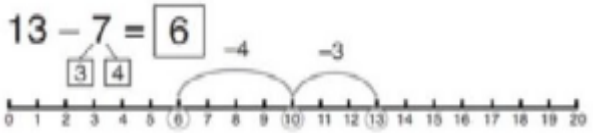
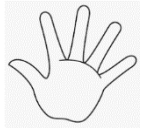
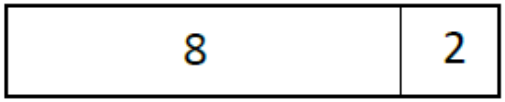
46 + 27
 

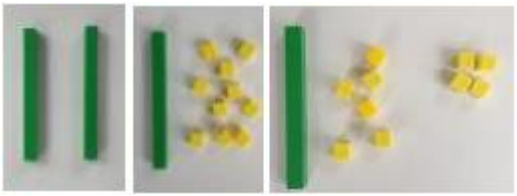
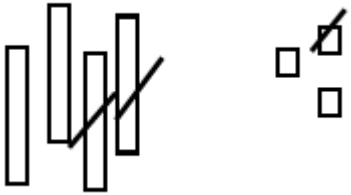
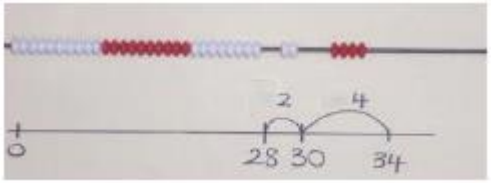
43 + 20 + 10 = 73
  </td><td>Children to draw a Representation of the grid to further support their understanding, carrying the ten <u>underneath</u> the line.
 
</td><td>Start by partitioning the number before formal column method to show the exchange.
20 + 5
40 + 8
60 + 13 = 73

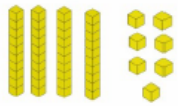
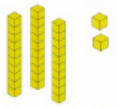
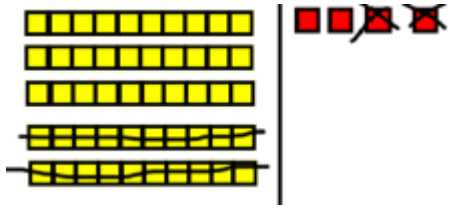
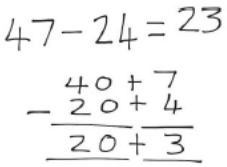
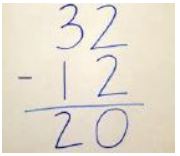
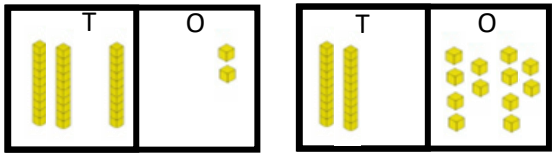
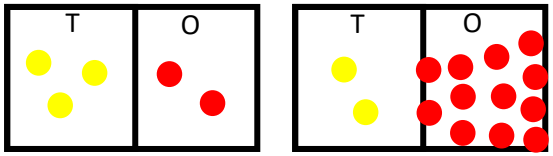
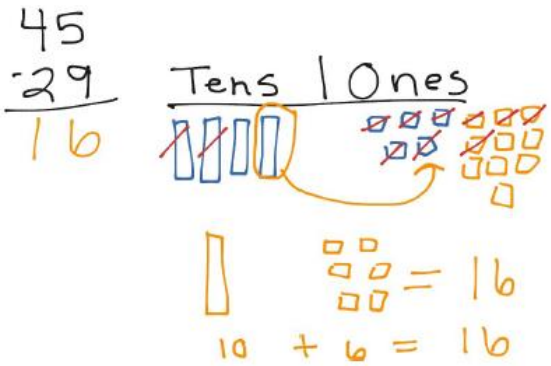
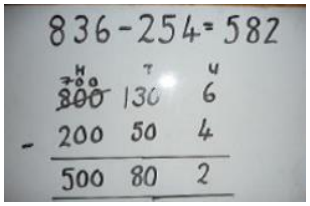
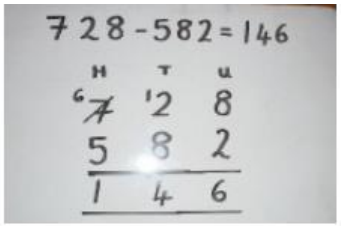
Add the ones, exchanging for ten and carrying it <u>underneath</u> the line.
536
+ 85
621
1 1</td></tr>
</table>

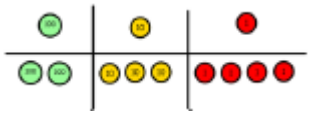
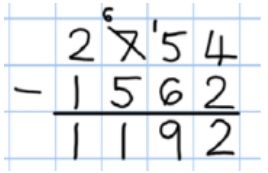
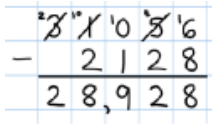
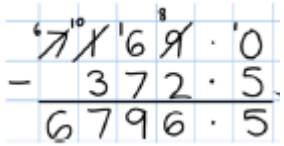
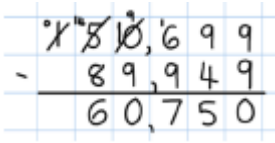
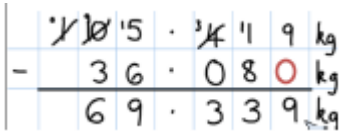
	Strategy	Concrete	Pictorial	Abstract
Year 4 Addition	Add numbers with up to 4 digits	Children continue to use base 10 or place value counters to add, exchanging ten ones for a ten etc. 268 + 157 = 425 	Draw representations using place value grid. Exchanged tens to be carried **underneath** the Line. 	Continue from previous work, carrying hundreds as well as tens. 
Year 5 Addition	Add numbers with more than 4 digits	As Year 4	As Year 4	
	Add decimals with 2 decimal places, including money.	Introduce decimal place value counters 	As Year 4, but using decimal place. Emphasise how the decimal point must be lined up within the calculation.	
Year 6 Addition	Add several numbers of increasing complexity including money, measure and decimals with different numbers of decimal places.	As Y5	As Y5	Insert zeros for placeholders where necessary. 

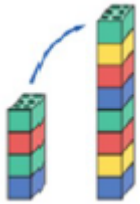
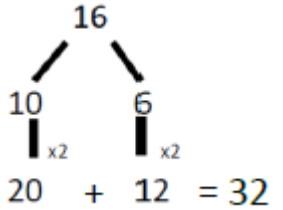
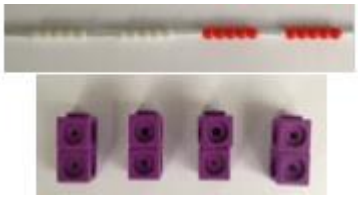
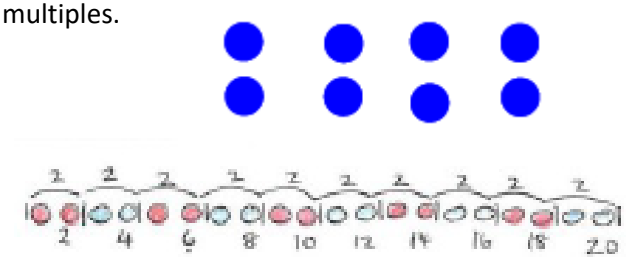
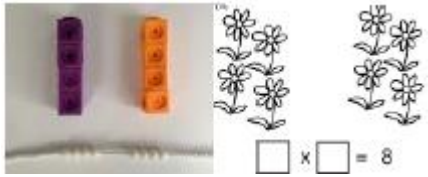
Year 1 Subtraction	Strategy	Concrete	Pictorial	Abstract
	Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away.  4 – 2 = 2	Cross out the objects to show what has been taken away  15 – 3 = 12	7 – 4 = 3 16 – 9 = 7
	Counting back	Move objects away from the group, counting backwards.  7, 6, 5 7 – 2 = 5	Count back in ones using a number line 	Put 13 in your head, count back 4. What number are you at?
		Move the beads along the string as you count backwards. 		
	Find the difference	Compare objects and amounts.  7 is 3 more than 4 I am 3 years older than my sister	Count on using a number line to find the difference 	Hannah has 12 sweets and her sister has 5. How many more does Hannah have than her sister?
		Lay objects to represent a bar model 		

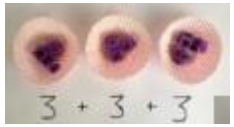
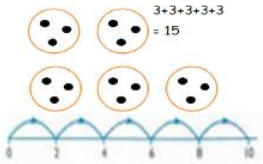
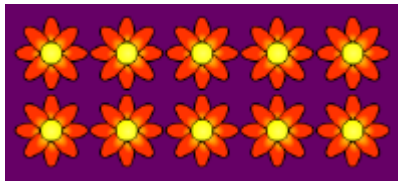
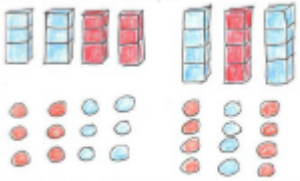
	Strategy	Concrete	Pictorial	Abstract
Year 1 Subtraction	Represent and use number bonds and related subtraction facts within 20. Part-whole model.	Link to addition. Use part-whole model to show the inverse.  If 10 is the whole and 6 is one of the parts, what is the other part? 10 – 6 = 4	Use pictures to represent the part-whole model 6 – 2 = 4 	Use numbers in part-whole model 
	Make 10	14 – 5 = 9 Make 14 on the 10 frame. Take 4 away to make ten, then take one more away so that you have taken 5. 	Count down 3 first to ten, then another 4 to 7. 	16 – 8 How many do we take off to get to 10? How many left to take off? Count on fingers if necessary 
	Bar model	Use objects in a line, separate  2 3 5 – 3 = 2	10 – 2 = 8 	 10 = 8 + 2 10 = 2 + 8 10 – 2 = 8 10 – 8 = 2

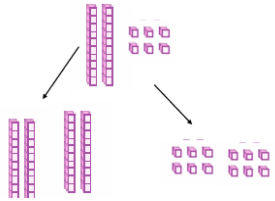
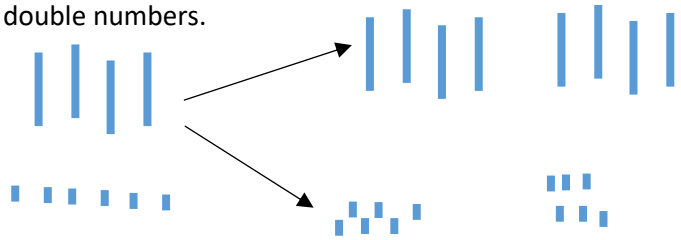
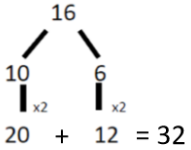
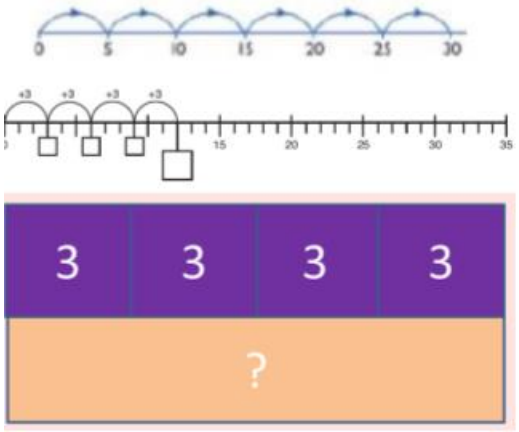
	Strategy	Concrete	Pictorial	Abstract
Year 2 Subtraction	Regroup a ten into ten ones.	Use a place value chart to show how to change a ten into ten ones. 	Draw pictorial representations and cross them off. 20 – 4 = 	Mental strategies 20 – 4 = 16
	Partitioning to subtract without regrouping.	Use Base 10 to show how to partition the number when subtracting without regrouping. 34 – 13 = 21 	Draw representations of Base 10 and cross off. 43 – 21 = 22 	Mental strategies 43 – 21 = 22
	Make ten strategy – counting on	Use a bead bar or bead strings to model counting to next ten and the rest. 34 – 28 = 	Use a number line to count on to the next ten and then the rest.  'counting on' to find 'difference'	Mental strategies 93 – 76 = 17

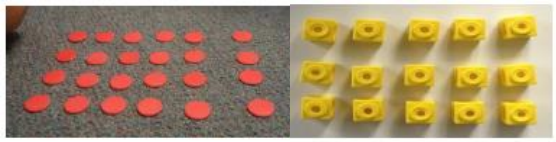
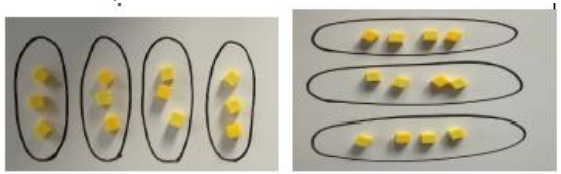
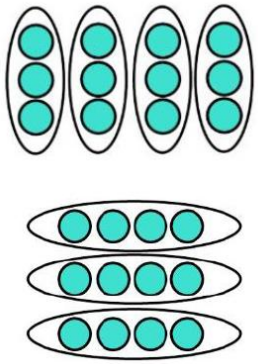
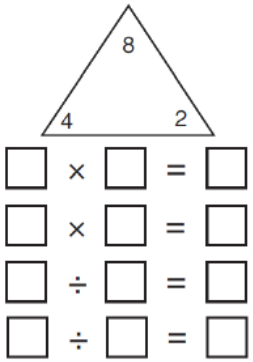
<table>
<tr><td rowspan="3">Year 3 Subtraction</td><td>Strategy</td><td>Concrete</td><td>Pictorial</td><td>Abstract</td></tr>
<tr><td>Column subtraction without regrouping</td><td>Use base 10 to model
 
 
47 – 15 = 32</td><td>Draw representations to support understanding.
54 – 22 = 32
  </td><td>Begin by partitioning into place value
 
Then use formal methods.
  </td></tr>
<tr><td>Column subtraction with regrouping</td><td>Use base 10. 32 - 9
 
Move to place value counters, modelling the exchange of a ten into ten ones.
  </td><td>Draw base 10 or place value counters and cross off.
  </td><td>Begin by partitioning into place value columns.
 
Then move onto formal methods.
  </td></tr>
</table>

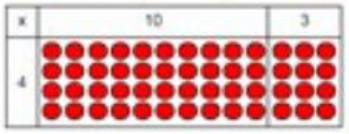
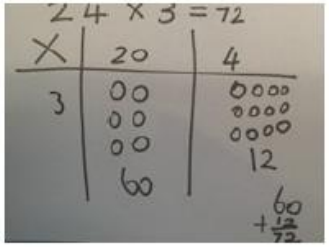
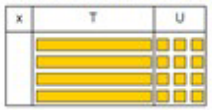
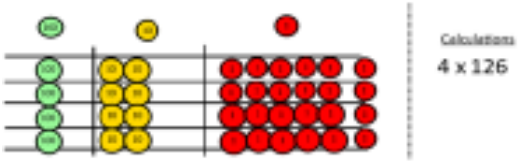
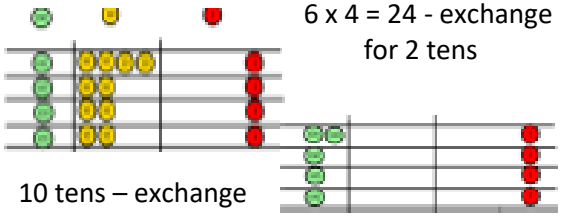
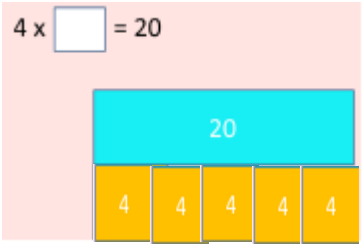
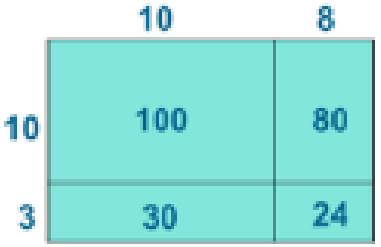
	Strategy	Concrete	Pictorial	Abstract
Year 4 Subtraction	Subtract with up to 4 digits	234-179 Model process of exchange using base 10 and then place value counters (as Y3) 	Children to draw place value counters and show their exchange – as Year 3.	Exchange tens for ten ones by crossing out and carrying. 
Year 5 Subtraction	Subtract with at least 4 digits, including money and measures.	As Year 4	As Year 3	Use zeroes for placeholders.  
Year 6 Subtraction	Subtract with increasingly large and more complex numbers and decimal values.	As Year 4	As Year 3	 

	Strategy	Concrete	Pictorial	Abstract
Year 1 Multiplication	Doubling	Use practical activities using manipulatives including cubes to demonstrate doubling. Double 4 is 8 	Draw pictures to show how to double numbers. Double 4 is 8 	Partition a number and then double each part before recombining it. 
	Counting in multiples	Count the groups as children are skip counting. Children may use their fingers as they are skip counting. 	Children draw representations to show counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10
	Making equal groups and counting the total	Use manipulatives to make equal groups. 	Draw representations to show equal groups. Draw  to show 2 x 3 	2 x 4 = 8

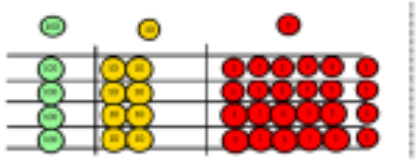
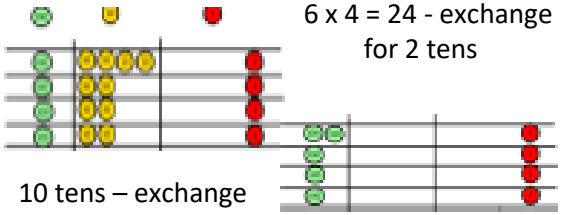
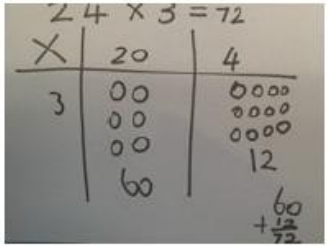
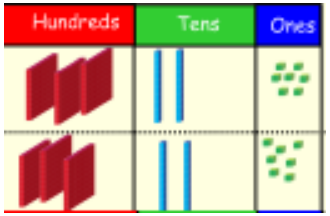
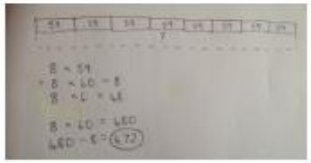
	Strategy	Concrete	Pictorial	Abstract
Year 1 Multiplication	Repeated addition	Use different objects to add equal groups.  	Use pictorial number lines to solve problems. There are 3 sweets in each bag. There are 5 bags. How many sweets are there altogether? 	Write addition sentences to describe objects and pictures.  2 + 2 + 2 + 2 + 2 = 10 2 x 5 = 10
	Understanding arrays	Use objects laid out in arrays to find the answers to 2 lots of 5, 3 lots of 2 etc. 	Draw representations of arrays to show understanding. 	3 x 2 = 6 2 x 5 = 10

Year 2 Multiplication	Strategy	Concrete	Pictorial	Abstract
	Doubling	Model doubling using base 10 and place value counters. Double 26 is double 20 and double 6 40 + 12 = 52 	Draw pictures and representations to show how to double numbers. 	Partition a number and then double each part before recombining. 
	Counting in multiples of 2, 3, 4, 5, 10 from 0 Repeated addition	Count the groups as children are skip counting; children may use their fingers.  5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40 	Number lines, counting sticks and bar models should be used to show representation of counting in multiples. 	Count in multiples of a number aloud.
		Use bar models. 		Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, (12) 15 0, 5, 10, 15, 20, 25 4 x 3 = 12

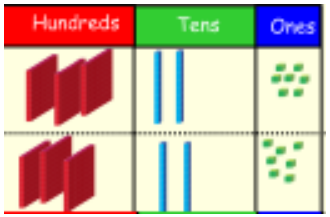
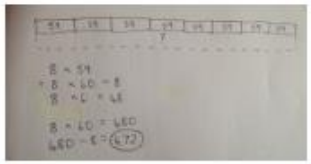
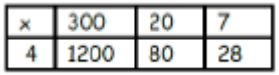
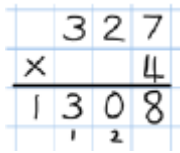
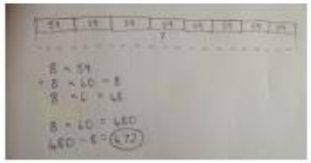
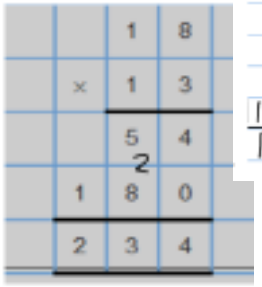
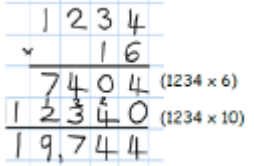
	Strategy	Concrete	Pictorial	Abstract
Year 2 Multiplication	Multiplication is commutative	Create arrays using counters and cubes.  Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer. 	Use representations of arrays to show different calculations and explore commutativity. 	12 = 3 x 4 12 = 4 x 3 Use arrays to write multiplication sentences and reinforce repeated addition. 5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15 
	Using the inverse (This should be taught alongside division, so pupils learn how they work alongside each other.)	Use cubes or counters to identify the inverse. 4 lots of 2 = 8 8 split into groups of 2 = 4 	Explore fact families using a triangle model. 	Identify all related fact family sentences. 2 x 4 = 8 4 x 2 = 8 8 ÷ 4 = 2 8 ÷ 2 = 4 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8 ÷ 2

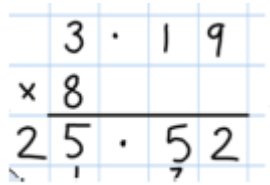
	Strategy	Concrete	Pictorial	Abstract
Year 3 Multiplication	Grid Method	Show links with arrays to first introduce the grid method.  4 rows of 10 4 rows of 3	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below. 	Start with multiplying by one digit numbers and showing the clear addition alongside the grid.  210 + 35 = 245
		Move onto base 10 to move towards a more compact method.  4 rows of 13		
		Move onto place value counters to show how we are finding groups of a number.  Add up each column, making any exchanges needed.  6 x 4 = 24 - exchange for 2 tens 10 tens – exchange for 1 hundred.	Use bar models to explore missing numbers. 	Moving forward, multiply by a 2-digit number, showing the different rows within the grid method. 

Year 4 Multiplication

Strategy	Concrete	Pictorial	Abstract
Grid Method recap from year 3 for 2 digits x 1 digit	Move onto place value counters to show how we are finding groups of a number.  Calculations 4 x 126 Add up each column, making any exchanges needed.  6 x 4 = 24 - exchange for 2 tens 10 tens – exchange for 1 hundred.	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.  	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. **210 + 35 = 245**
Column multiplication	Children can use Base 10 or place value counters.  Model column Method 327 X 2	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods. 	Use the grid method to show how this relates to a formal written method. 3 2 7 X 4 2 8 (4 x 7) 8 0 (4 x 20) 1 2 0 0 (4 x 300) 1 3 0 8 Then look at compact methods 3 2 7 X 4 1 3 0 8 1 2

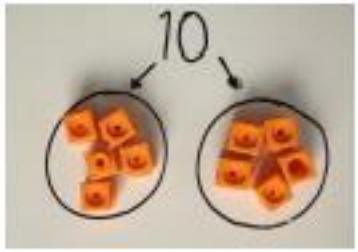
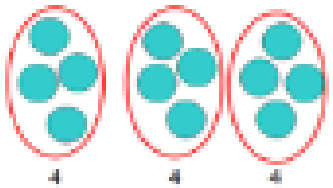
Year 5-6 Multiplication

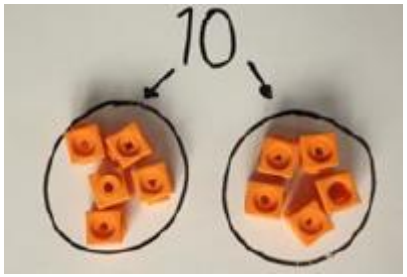
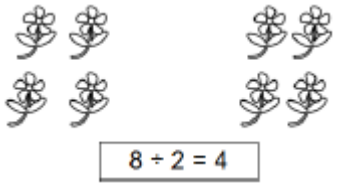
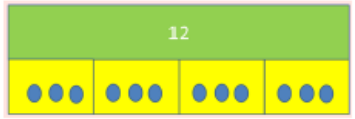
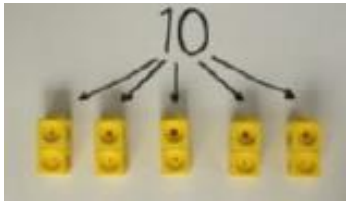
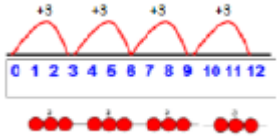
Strategy	Concrete	Pictorial	Abstract
Column multiplication for 3 and 4 digits x 1 digit.	Children can use Base 10 or place value counters.  Model column Method 327 X 2	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods. 	Use the grid method to show how this relates to a formal written method.  3 2 7 X 4 2 8 (4 x 7) 8 0 (4 x 20) 1 2 0 0 (4 x 300) 1 3 0 8 Then look at compact methods 
Column multiplication.	Manipulatives may still be used with the corresponding long multiplication modelled alongside.	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods. 	  When exchanging, place carried numbers **underneath** the next digit. Add the zero as a placeholder.

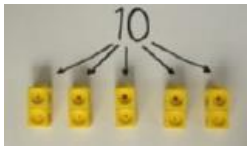
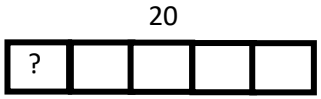
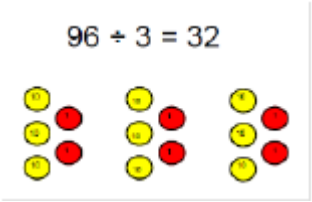
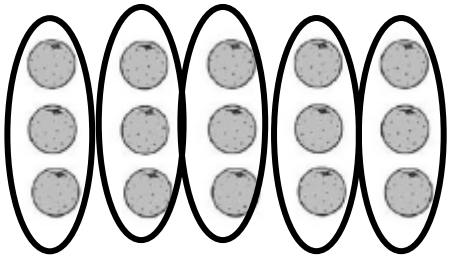
	Strategy	Concrete	Pictorial	Abstract
Year 6 Multiplication	Multiply decimals up to 2 decimal places by a single digit.	As Y5	As Y5	Remind children of place value and the importance of lining up the decimal points. Multiplications still start from the digit furthest to the right. 

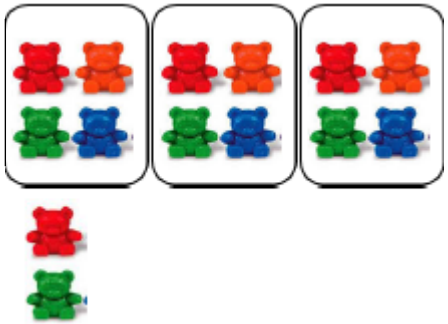
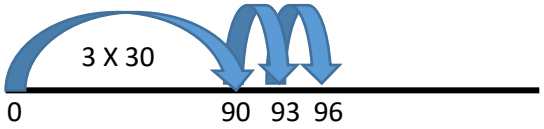
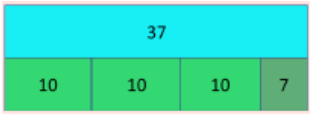
Multiplication tables

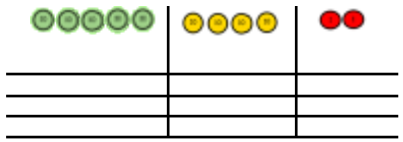
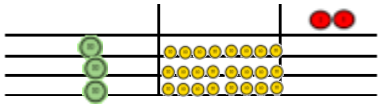
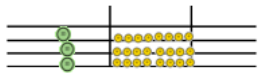
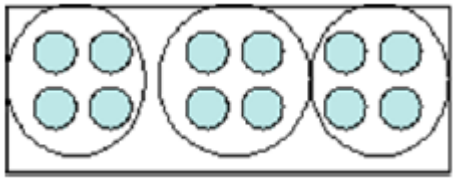
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2, 3, 4, 5, 10	Starting in Year 3, children are given a Times Table Rockstars login. They work through the full programme every year to improve their speed and keep practising. By the time they do their Year 4 tables test, they will have been through the programme twice. Extra interventions will be given as needed to ensure that all children are up to age related expectations.			

	Strategy	Concrete	Pictorial	Abstract
Year 1 Division	Division as sharing	Use cubes and objects.   	Children use pictures or shapes to share quantities. 8 shared into two groups = 4   12 shared between 3 is 4	12 shared between 3 is 4.

	Strategy	Concrete	Pictorial	Abstract
Year 2 Division	Division as sharing	I have 10 cubes. Can you share them equally in 2 groups? 	Children use pictures or shapes to share quantities.  Children use bar modelling to show and support understanding. 	12 ÷ 3 = 4 Share 12 between 3 people – how many do they each have?
	Division as grouping	Divide quantities into equal groups.  Use cubes, counters or other objects to aid understanding. 	Use number lines for grouping.  Use a bar model. Think of the bar as a whole. Split into the number of groups you are dividing by and work out how many would be within each group. 20  20 split into 5 groups =	20 ÷ 5 = 4 Divide 20 into 5 groups – how many are in each group?

	Strategy	Concrete	Pictorial	Abstract
Year 3 Division	Division as grouping	Use cubes, objects or counters to aid understanding. 	Continue to use bar models to aid understanding and problem solving.  20 ÷5 = 4	How many groups of 6 in 24? 24 ÷ 6 = 4
		Divide larger numbers using base 10 or place value counters. 		
	Division with arrays	Link division to multiplication by creating an array and thinking about the fact families that can be created. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15 	Draw an array and circle to split the array into groups to make fact families. Eg 15 ÷ 5 = 3 15 ÷ 3 = 5 5 x 3 = 15 3 x 5 = 15 	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4

	Strategy	Concrete	Pictorial	Abstract
Year 3 Division	Division with remainders.	Divide objects between groups and see how much is left over. 14 ÷ 3 = 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  13 ÷ 4 3 remainder 1 For larger numbers, when it becomes inefficient to count in single multiples, larger jumps can be recorded using known facts. 96 ÷ 3 = 32  	Complete written divisions and show the remainder using 'r' Use appropriate vocabulary 29 ÷ 8 = 3 r 5 dividend divisor quotient remainder
			Draw dots and group them to divide an amount and clearly show a remainder.  14 ÷ 3 4 remainder 2	
			Use a bar model to show division with remainders.  37 ÷ 10 3 remainder 7	

	Strategy	Concrete	Pictorial	Abstract
Year 4-6 Division	Division at least 3 digit numbers by 1 digit Short division	Use place value counters to divide using the bus stop method alongside. 542 ÷ 3  In contrast to the column method, we start with the largest place value. If you divide 5 hundreds by 3, you can place 1 hundred in each row with 2 left over.  $\begin{array}{r} 1 \\ 3\overline{)5^{2}4\ 2} \end{array}$ You can now exchange the 2 remaining hundreds for 20 tens.  $\begin{array}{r} 1\ 8 \\ 3\overline{)5^{2}4\ 2} \end{array}$ 24 tens can be divided evenly into 3 rows, therefore no more exchanging needs to take place. 2 ones cannot be divided equally into 3 rows, so they are moved into the remainders column.  $\begin{array}{r} 1\ 8\ 0\ \text{r}\ 2 \\ 3\overline{)5^{2}4\ 2}\ \ .. \end{array}$	Pupils can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  12 ÷ 4 = 3 They should be encouraged to develop more efficient methods.	Begin with divisions that divide equally with no remainder. $\begin{array}{r} 2\ 1\ 8 \\ 4\overline{)8\ 7^{3}2} \end{array}$ Move onto divisions with a remainder. $\begin{array}{r} 8\ 6\ \text{r}\ 2 \\ 5\overline{)4\ 3^{3}2} \end{array}$ Move onto decimal places to divide accurately. $\begin{array}{r} 2\ 1\ .\ 8 \\ 4\overline{)8\ 7\ .^{3}2} \end{array}$ $\begin{array}{r} 0\ 6\ 6\ 3\ \text{r}\ 5 \\ 8\overline{)5^{5}3^{5}0^{2}9} \end{array}$

Year 6 Division

Strategy	Concrete	Pictorial	Abstract
Long division	Concrete methods would be inefficient here.	Pictorial methods would be inefficient here.	

432 ÷ 12

Step 1.
List multiples of the divisor up to 100.

$12 \times 1 = 12$
$12 \times 2 = 24$
$12 \times 3 = 36$
$12 \times 4 = 48$
$12 \times 5 = 60$
$12 \times 6 = 72$
$12 \times 7 = 84$
$12 \times 8 = 96$

Step 2.
Set out as bus stop method and start with the greatest place value.

		0		
1	2	4	3	2

4 ÷ 12 = 0 r 4

Step 3.
Combine the first two digits to create a dividend.

		0		
1	2	4	3	2

12 x 3 = 36 so
43 ÷ 12 = 3 r 7

Place the quotient below the dividend and add a placeholder. Subtract it from the full dividend to create a new dividend.

		0	3	
1	2	4	3	2
	–	3	6	0
			7	2

Step 4.
Divide the new dividend by the divisor.

12 x 6 = 72
72 ÷ 12 = 6

Place the quotient below the dividend. Subtract it from the full dividend to see if there are any remainders.

		0	3	6
1	2	4	3	2
	–	3	6	0
			7	2
	–		7	2
				0